HRA-1RI-8-HS01754-01
Amd 5RI-8-HS01754-02
Source: HCFA Conference Proceedings - Physicians and Financial Incentives
HCFA Pub No 03067 Dec 1980 NTIS# PB82-133657 check
PB82133695
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Hospital Utilization Effects of Case Reimbursement for Medical Care

by Gene A. Markel

The subject of this paper is an experimental program that Pennsylvania Blue Shield (PBS) conducted which tested an alternative method of reimbursing physicians for in-patient medical services. At Pennsylvania Blue Shield this method initially was called payment by diagnosis, but later came to be known as per-case reimbursement (PCR).

Traditionally, physicians are reimbursed for in-hospital medical care on a disaggregated fee-for-service basis. This involves separate payment increments for each hospital visit, each medical examination, and other similar medical services provided by the attending physician. Since the physician's income under a fee-for-service arrangement depends upon the number of services rendered, there would appear to be some financial incentive for the physician to deliver as many services as possible. Ultimately, this may be translated into an incentive to extend hospital stays—or at least to forego opportunities to reduce length of stay.

If it is true that physicians—either consciously or unconsciously—sense and respond to such incentives, then it may be hypothesized that a prospective and somewhat more global approach to paying the doctor should yield shorter hospital stays and reduce the overall costs per case. Specifically, in our experiment, the primary attending physician was paid what we thought to be an equitable fixed payment allowance for a whole case. Only the disease was considered and not the specific length of treatment. We believed that these kinds of incentives would lead to reductions in length of stay, and in so doing, would reduce the total cost per case. The per-case reimbursement approach is an attempt to capitalize upon the physician's natural desire to accentuate the relationship between his or her work and his or her income within a reimbursement scheme that encourages shorter rather than longer lengths of stay. While the possibilities of such an approach often have been speculated upon, the case reimbursement concept for medical care remained largely untested until the time of our experiments.

Historical Development of the Project

In 1972, Pennsylvania Blue Shield undertook a small project to test some of these concepts at a single hospital located in northeastern Pennsylvania. Fifteen frequently occurring diagnoses were selected for inclusion. A schedule of case payment allowances was developed, based upon Blue Shield claims experience for these diagnoses. Five physicians on the hospital staff participated in the program and agreed to accept case allowances as payment in full for cases involving medical care to Blue Cross/Blue Shield subscribers hospitalized at the participating institution for any of the selected conditions.

This initial exploratory program ran for a period of one year. The results were sufficiently encouraging to lead us to seek a more extensive test of the per-case reimbursement concept. The first stage of expansion was implemented in January, 1974. Hospital participation at this time was broadened to five institutions; and fifty-two physicians participated. These physicians represented approximately half of the combined medical staffs of the participating hospitals.

In July of 1975, with the assistance of a federal research grant from the Health Resources Administration, the experimental program in the field was extended for a period of one additional year, and concurrently was expanded to include a still larger number of hospitals and physicians. The remainder of this paper is concerned with this most recent stage of the experiment.

Description of Experimental Program

The experimental Per-Case Reimbursement program operating in the field during the period July 1, 1975, through June 30, 1976, included a total of ten participating hospitals. One of these hospitals was the site of the original experimental program in 1972. Because of its prior involvement, this hospital's experience was excluded from the data base used in evaluating effects observed in the expanded program. The remaining nine hospitals were dispersed throughout various parts of the state. Two were in the Greater Philadelphia area; three were in eastern Pennsylvania locations; one was located in the central part of the state; and three were located in western Pennsylvania. The participating hospitals were of small-to-medium size, averaged 212 beds, and had a mean [illegible]ancy rate of approximately 74 percent throughout the [illegible]1973–1975. These participating institutions provided [illegible]nably representative cross-section of non-[illegible]ary, non-teaching general community hospitals in [illegible]nsylvania. Conscious effort was made to exclude teaching hospitals and hospitals offering high levels of specialized services, since these might be expected to treat relatively larger proportions of unusual and complicated cases, with corresponding differences in treatment modalities.

Ninety-one physicians on the staffs of these nine hospitals agreed to participate in the program and to accept scheduled PCR allowances as payment in full for qualifying Blue Cross/Blue Shield patients. However, only sixty-one of these doctors actually participated by sending in claims. This sample included thirty-five general and family practitioners and twenty-six specialists. The specialists were principally in internal medicine, cardiology and urology. Physician participation was entirely voluntary.

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This is an abbreviated version of *Per-Case Reimbursement for Medical Care,* Pennsylvania Blue Shield Research Report 77–5, March 1977.

This research was supported by grants HRA-1RI-8-HS01754-01 and 5RI-8-HS01754-02.

Although it might be argued that a population of physicians enlisted on this basis is not necessarily representative of physicians in general, there was little alternative, since there was no effective leverage to assure the cooperation of particular physicians.

Twenty-four disease classifications were included in this stage of the program. The objective was to establish well-defined class sets, in which specific diseases within any given class are reasonably homogeneous, and which occur with sufficient frequency to provide adequate sample sizes. The included disease categories, with corresponding ICDA codes, are listed below.

Diagnosis/Disease Category	ICDA-8	H-ICDA
Arterial embolism and thrombosis, gangrene	444.0–445.9	440.0–445.9
Arteriosclerosis	440.0–440.9	440.0–440.9
Arthritis and rheumatism	710.0–718.0	710.0–718.0
Asthma	493.0	493.0, 493.9
Bronchitis and bronchiolitis, acute	466.0	489.0, 489.1
Bronchitis, chronic and unqualified	490.0–491.0	490.0–491.2
Cerebrovascular disease	430.0–438.9	430.0–438.9
Cystitis	595.0	595.0–595.9
Diabetes mellitus	250.0–250.9	250.0–250.7
Disease of thyroid gland	240.0–246.0	240.0–246.0
Emphysema	492.0	492.0
Gastric, duodenal and gastrojejunal ulcer	531.0–534-9	531.0–534.3
Gastritis and duodenitis	535.0	535.0
Gastroenteritis	009.2	009.2
Hypertension, essential or malignant	400.0, 401.0	400.0, 401.0
Infections of the kidney	590.0,590.1	590.0,590.2
Ischemic heart disease, acute	410.0–410.9	410.0–410.9
Ischemic heart disease, subacute, chronic and asymptomatic; angina pectons	411.0–414.9	411.0–414.0
Pneumonia	480.0–486.0	480.0–486.0
Pulmonary embolism and infarction	450.0	450.0
Rheumatic heart disease, chronic	393.0–398.0	393.0–398.0
Symptomatic heart disease	427.0–428.0	415.0–416.9 425.2–425.9 427.0–427.9
Thrombophlebitis	451.0–451.9	451.0–451.9
Upper respiratory infection, acute	460.0–465.0	460.0–465.0

Recommended payment allowances were developed for each disease category. This was done by examining data and information on average length of stay for given diagnoses from Hospital Utilization Program (HUP) and Professional Activity Study (PAS) reports, typical patterns of physician services reflected in Blue Shield claims experience, and applicable medical price information from Blue Shield data bases. The physicians who had agreed to participate were given an opportunity to review the proposed payment amounts and a few minor changes were negotiated. Finally, the proposed schedule was reviewed by Pennsylvania Blue Shield Medical Advisors. The resulting payment allowances represented a fair market value for each of the covered medical services and were readily acceptable to the participating physicians. Participating physicians were required to accept the finally established payment levels as payment in full for services delivered under the program.

A number of conditions had to be satisfied for claims to be eligible for payment under the terms of this experimental program:

(a) The patient had to be a Blue Shield subscriber with coverage for in-hospital medical care benefits;
(b) The patient was required to be a medical inpatient at one of the participating hospitals, with a participating doctor serving as the physician primarily in charge of his case;
(c) Hospital admission must have occurred during the experimental period;
(d) The patient's discharge diagnosis must have been one of those included in the program;
(e) Cases involving definitive surgery during the same hospital stay were not eligible for PCR payment;
(f) The patient must have been under 65 years of age;
(g) Cases with length of stay less than two days, or more than 60 days were excluded; and
(h) The patient must have been discharged with the approval of the attending physician, and not transferred to another facility.

Except for certain designed variations described below, these conditions also constituted the criteria used in defining control groups used for comparison.

Research Objectives and Design

The primary objectives of the research and evaluation component of the project were: (1) to obtain quantitative measures of any differences or changes in length of stay (LOS) that might be attributable to the per-case method of reimbursement; and (2) to examine the cost implications of any observed variations in length of stay. The experimental design involved four comparative experience groups.

Group 1 was the experimental group. It consisted of patients with Blue Cross/Blue Shield coverage, and who satisfied all of the qualifying criteria described earlier.

Group 2 was a cross-sectional control group consisting of patients satisfying exactly the same selection criteria, except their costs were not covered by Blue Cross/Blue Shield. As such, these cases would not have been handled under the per-case method of physician reimbursement, but would otherwise constitute a very similar population. These were cases in which the patients were treated for the same range of conditions, by the same doctors, in the same hospitals, during the same period of time as the experimental population.

Groups 3 and 4 were longitudinal reference groups. These groups of patients were treated for the same range of conditions, by the same doctors, and in the same hospitals as Groups 1 and 2, but at an earlier time—1973.

Data for the experimental population were taken from PCR claim forms submitted to Blue Shield by participating physicians. Data for cross-sectional and longitudinal comparison groups were taken from Hospital Utilization Program (HUP) and Professional Activity Study (PAS) records to which the participating hospitals had granted access. Data for all four groups were collected and maintained in such a manner as to permit stratification by

diagnosis categories, by specific participating hospitals or physicians, by type of physician provider, and by various patient characteristics.

Average LOS was computed for each diagnostic category at each hospital. Changes or differences in LOS were measured and expressed in terms of simple arithmetic differences between average LOS for corresponding cells in different groups. Since length-of-stay data distributions tend to be markedly non-Gaussian, nonparametric statistical methods were used to determine the significance of observed differences. The analysis focused principally upon measurement of longitudinal changes in LOS occurring between the experimental group and its historical antecedent (Group 3 to Group 1), and upon the comparison of these changes with corresponding changes in the cross-sectional control groups (Group 4 to Group 2).

Cost implications were studied by comparing actual Blue Cross and Blue Shield payments to the payment levels that might have been expected for these same cases if the PCR program had not intervened.

Findings and Conclusions

Forty-five hospital/diagnosis combinations satisfied minimum sample size requirements in all four blocks of the design; and longitudinal changes in average LOS were computed for these forty-five data sets (Table 1). A favorable outcome here may be defined as one in which average LOS showed a greater decline (or a smaller increase) for the experimental group than for the control group. By this definition, approximately half of the observed LOS changes were favorable, and half unfavorable. Looking only at the hospital/diagnosis combinations for which observed changes were statistically significant, however, the outcome was more definitive—indicating nine favorable experimental outcomes, four unfavorable, and one that was for all practical purposes indecisive.

Closer examination of the comparative results revealed some striking differentials in experimental outcomes at different hospital sites (Table 2). To measure the experimental program's effectiveness at any given hospital, the observed LOS change for the experimental group was adjusted by subtracting from it the corresponding control group change. This is assumed to be a reflection of the background trend in LOS at that hospital. Using this "net change" concept, four of seven hospitals that produced enough data to be evaluated showed changes favorable to the PCR experimental group. Two of the PCR experimental groups showed changes more favorable to the control group (one of which had an extremely small base of experience and should perhaps be disregarded); and one showed no substantial difference between experimental and control group changes. Net reductions in average length of stay at sites more favorable to the PCR group ranged from 14 to 30 percent.

Ranking the experimental hospital sites on the basis of observed PCR effectiveness, and then also ranking them on the basis of their 1973 (pre-experimental) occupancy rates, the two sets of rankings were found to be strongly correlated. This indicates that PCR apparently is most effective in reducing LOS at hospitals with lower *a priori* occupancy rates. It supports a hypothesis that hospitals with low occupancy rates may seek to maintain higher occupancy by tolerating some slack in their lengths of stay; and that PCR then is effective primarily in reducing this slack to whatever degree it exists.

The cost implications of LOS changes are shown on Table 3. This table displays a summary of the differences between actual and expected Blue Cross/Blue Shield payments for experimental cases at each of the six hospitals yielding enough experience to be so evaluated. Two of these experimental sites show apparently adverse financial results. To explain these negative outcomes, it may be noted that the bad financial outcome at hospital E arose from the fact that average LOS increased for both the experimental and control populations. The LOS increase for the experimental group, however, was considerably less than for the control gorup; and in this sense, the PCR method was in fact successful here. At hospital D, it was found that a fairly large expansion had been undertaken between 1973 and 1975. It can be conjectured that there may have been great pressure here to maintain the occupancy rate, contrary to PCR incentives.

In general, the PCR method of reimbursement can be expected to result in higher levels of Blue Shield payout to physicians. This does not mean that physicians are being granted a price increase for services delivered to PCR patients. The incremental Blue Shield payout more correctly should be seen as the difference between a "full payment" plan and Blue Shield's normal reimbursement schedules (which frequently provide less than full payment). It represents that portion of the physician's total charge that otherwise would be an out-of-pocket expense for the patient, if it is paid at all.

At those hospitals where an LOS reduction *is* acheived and is greater than the reduction that might otherwise have been expected on the basis of prevailing LOS trends, the increased Blue Shield payment to physicians is more than compensated by reduced Blue Cross payments to the hospitals. A favorable trade-off is always assured by the simple fact that an inpatient hospital day costs considerably more than does a physician's hospital visit. The difference between those two cost components becomes the dollar value of each day of hospital utilization saved.

In summary, results obtained from the PCR experimental program provide reasonably conclusive evidence that the case method of reimbursement can be effective in promoting shorter lengths of stay for inpatient medical cases. The effectiveness of this method of reimbursement varies quite greatly, however, from one hospital to another. Although the reasons for these differences in response to PCR are not entirely clear, they can be explained at least partially by the hospitals' *a priori* occupancy rates. One can conclude that hospitals with lower occupancy rates tend to have more slack in their average lengths of stay, and that the case method of reimbursement is effective primarily in reducing this slack to whatever extent it may exist.

Table 1
Longitudinal Changes in Length of Stay for Experimental and Cross-Sectional Populations (Change from 1973 to experimental period, 7/75–6/76)

Hospital/Diagnosis Category	LOS Change (Days)* Experimental Population	LOS Change (Days)* Cross-Section Population
Hospital A		
Asthma	−5.4 *	−3.5 *
Bronchitis and bronchiolitis: acute	+0.3	+0.4
Diabetes mellitus		
Ulcer: gastric, duodenal, etc.	+0.5	+0.1
Gastritis and duodenitis	−1.8 *	−1.9 *
Gastroenteritis	−1.2 *	0.0
Ischemic heart disease: acute	−0.8	−0.1
Ischemic heart disease: subacute, etc.	−2.5	+0.8
Pneumonia	−1.0	−0.7
Symptomatic heart disease	−0.2	0.0
Thrombophlebitis	+1.5	+0.4
Upper Respiratory infection	−4.3 *	−0.5
	+0.6	+0.5
Hospital B		
Gastroenteritis		
Ischemic heart disease: acute	+0.6	−0.2
Ischemic heart disease: subacute, etc.	−1.5 *	+3.6
	+1.1	−0.3
Hospital C		
Bronchitis and bronchiolitis: acute	−1.7	−3.2
Ulcer: gastric, duodenal, etc.		
Ischemic heart disease: acute	−2.0 *	−1.8
Ischemic heart disease: subacute, etc.	−2.8 *	+0.6
Pneumonia	−0.2	−0.1
Symptomatic heart disease	−2.0	−1.2
	−0.7	+3.2
Hospital D		
Bronchitis: chronic/ unqualified	+0.7	−1.1
Cerebrovascular disease	−4.0	−7.8
Diabetes mellitus	−5.1 *	−1.0
Gastroenteritis	−0.6	−0.8 *
Hypertension	+5.3	−1.0
Ischemic heart disease: acute	+1.2	−2.0
Ischemic heart disease: subacute, etc.	−2.5	−0.7
Pneumonia	+0.4	−0.7 *
Symptomatic heart disease	−0.8	−2.4
Upper respiratory infection	+0.2	+0.1
Hospital E		
Bronchitis and bronchiolitis: Acute	−1.3	−2.0 *
Gastroenteritis	+0.7	−1.4 *
Ischemic heart disease: subacute, etc.	+0.3	0.0
Pneumonia	−0.4	+3.6
Hospital F		
Asthma	+0.5	+0.2
Bronchitis and bronchiolitis: acute	−1.1	+0.2
Bronchitis: chronic/ unqualified		
Diabetes mellitus	−0.5	−1.0
Gastroenteritis	+1.6	0.0
Hypertension	−0.6	+0.2
Ischemic heart disease: acute	−4.0 *	+1.6
Ischemic heart disease: subacute, etc.	−0.9	+3.0 *
Pneumonia	+0.2	−0.1
	+1.2	−0.1
Hospital G		
Pneumonia	+0.8	+0.2

* Indicates LOS change is statistically significant at the .10 level.

Table 2
Average Change in Length of Stay, by Hospital

Hospital	Number of Diagnosis Categories Repesented	LOS Change from 1973 to 7/75–6/76 Period: Experimental Population Days	Experimental Population % Change	Cross-Section Population Days	Cross-Section Population % Change
A	12	−1.6	−19%	−0.4	− 5%
B	3	−3.1	−28%	+0.2	+ 2%
C	6	−1.9	−24%	−0.8	+10%
D	10	−0.1	− 1%	−0.8	−11%
E	4	+0.1	+ 2%	+1.3	+20%
F	9	+0.3	+ 4%	+0.6	+ 3%
G	1	+0.9	+14%	+0.2	+ 3%
Overall	15	−0.2	− 3%	0.0	0%

Table 3
Summary of Differences Between Actual and Expected Payments, by Hospital

Hospital	Experimental Cases Represented	Gain (LOSS) For Program: Blue Shield	Blue Cross	BC/BS Combined	Gain (LOSS) as Percent of Expected Payment: Blue Shield	Blue Cross	BC/BS Combined
A	249	($ 860)	$ 9,273	$ 8,413	(3.7%)	6.1%	4.8%
B	82	($1,335)	$ 6,414	$ 5,079	(15.5%)	7.0%	5.1%
D	82	($ 94)	$ 1,469	$ 1,375	(1.2%)	2.1%	1.8%
D	176	($ 277)	($12,184)	($12,461)	(1.7%)	(8.3%)	(7.6%)
E	92	($ 801)	($ 2,819)	($ 3,620)	(10.3%)	(4.6%)	(5.3%)
F	144	$2,697	$ 5,997	$ 8,694	19.3%	4.7%	6.1%

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